

## ABSTRACT

This invention relates to gas-impermeable, solid state materials fabricated into membranes for use in catalytic membrane reactors. This invention particularly relates to solid state oxygen anion- and electron-mediating membranes for use in catalytic membrane reactors for promoting partial or full oxidation of different chemical species, for decomposition of oxygen-containing species, and for separation of oxygen from other gases. Solid state materials for use in the membranes of this invention include mixed metal oxide compounds having the brownmillerite crystal structure.

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